Presentation to:
Wyoming Legislature Joint Corporations Committee

Presented by: Matthew Coeny

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Glenrock Energy: Introduction

Glenrock Energy, LLC ("Glenrock") is a carbon-management company

- ✓ Founded in 2016
- ✓ Based in Casper, Wyoming
- ✓ Developing carbon-capture projects in Wyoming
- ✓ Advancing a Statewide carbon-capture initiative
- ✓ Owns & operates the "Muddy-Glenrock" fields (1)
  - Existing oil production
  - Ideally suited for secure geological storage of captured CO_2
    - Deep-saline sequestration; and
    - Low-carbon oil production (2)

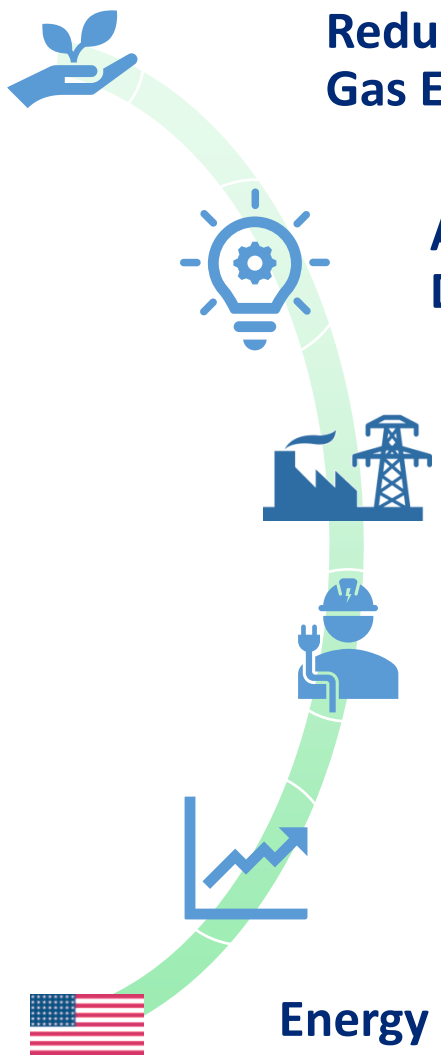
Executive Leadership

- Terrence R. Manning
  - Co-Founder & CEO
- Matthew Coeny
  - Managing Director, Finance

(1) Muddy-Glenrock fields consist of 33,192 mostly contiguous acres with 71 active wells, located in Converse County; State acreage comprises 62% of total; Glenrock largest contiguous block of State acreage in Wyoming; Federal acreage comprises only 9%

(2) Combining carbon-capture and tertiary recovery reduces net lifecycle CO_2 emissions per barrel of oil produced by up to 63% (source: Clean Air Task Force (2018) and International Energy Agency (IEA) (2015))

Benefits of Carbon-Capture



Reduced Greenhouse Gas Emissions

- Lower CO_2 emissions relative to 2021 IRP (1)

Affordable, Reliable & Dispatchable Electricity

- Thermal generation provides “24 x 7 x 365” electricity
- Lower costs, higher reliability & minimal technology risk relative to low-carbon alternatives

Existing Infrastructure & Resources

- Operate existing, critical infrastructure in an environmentally friendly manner

Employment

- Coal-fueled generation & associated coal production provide 1,600 direct jobs
- Traditional energy represents 11.8% of State employment
- Preserve communities & families

State & Local Revenue

- Maintain royalty & tax revenue
- Foster new businesses that need reliable, low-cost, low-carbon electricity—e.g., rare-earth elements, hydrogen, digital infrastructure

Energy Security

- Offset the decline of the shale sector—e.g., innovation & energy security

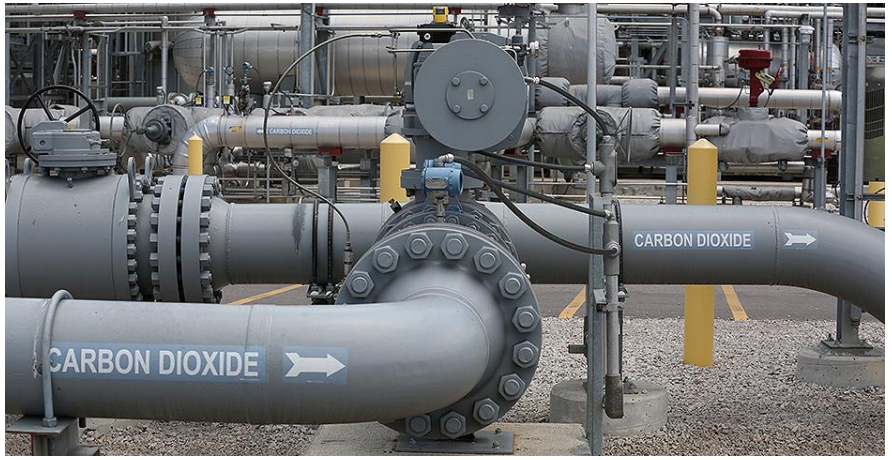
(1) Comparison is relative to PacifiCorp 2021 integrated resource plan (IRP) preferred portfolio and reflects displacement of coal- and natural gas-fueled unit(s) projected to remain in operation (without carbon capture) through 2037

Key Stakeholder Benefits

No increase in electricity prices	• **Commercial proposals, as presented currently, will result in lower costs, higher reliability, and reduced technology risk, relative to other low-carbon resources incorporated in 2021 integrated resource plan (IRP)**
Reliable & dispatchable electricity	• Ensure access to reliable and dispatchable, low-carbon electricity needed to meet customer needs & ensure system reliability throughout the Western Interconnection
Additional carbon reduction	• Displace natural gas- or coal-fueled unit(s) scheduled to remain in operation (without carbon-capture) through 2037 • Reduce CO_2 emissions by up to 4 million metric tons per year, relative to the 2021 IRP
Straightforward execution	• Avoid costs, risks, and uncertainty of decommissioning • Comply with statutory requirements of Wyoming SF-0159 and HB-0200 • Realize synergies with other projects—e.g., small nuclear reactor, Clean Energy Hub
Economic & Social Benefits for Wyoming	• Preserve & create well-paying jobs; maintain critical infrastructure, communities & families • Develop know-how that stakeholders can export to other states & countries • Foster businesses that need reliable, low-cost, low-carbon electricity—e.g., rare-earth elements, hydrogen, digital infrastructure

Carbon-Capture – Strong Candidates in Wyoming

- ✓ **Reliable, low-cost electricity**
  - Abundant, low-cost fuel & very low generation costs
- ✓ **Infrastructure & attributes for CO_2 storage**
  - Multiple, stacked reservoirs for sequestration
  - CO_2 may be transported via existing/future pipelines
- ✓ **Emissions control equipment on several generating units**
  - Removes particulate mater and SO_2
- ✓ **Commercially proven carbon-capture technology**
  - Mitsubishi process has been commercially deployed at 14 sites worldwide
  - Gasification, ammonia production are decades-old processes
- ✓ **Available capacity for carbon-capture retrofit**
  - System-side capacity factor of Wyoming coal-fueled fleet is 77% (1)



(1) Source: U.S. Environmental Protection Agency (EPA) Clean Air Markets web site

Glenrock Project: Schematic – "DJP"

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Post-combustion, carbon-capture at Dave Johnston generating station (DJP)

1

Low-cost, reliable & dispatchable electricity from Wyoming coal

3

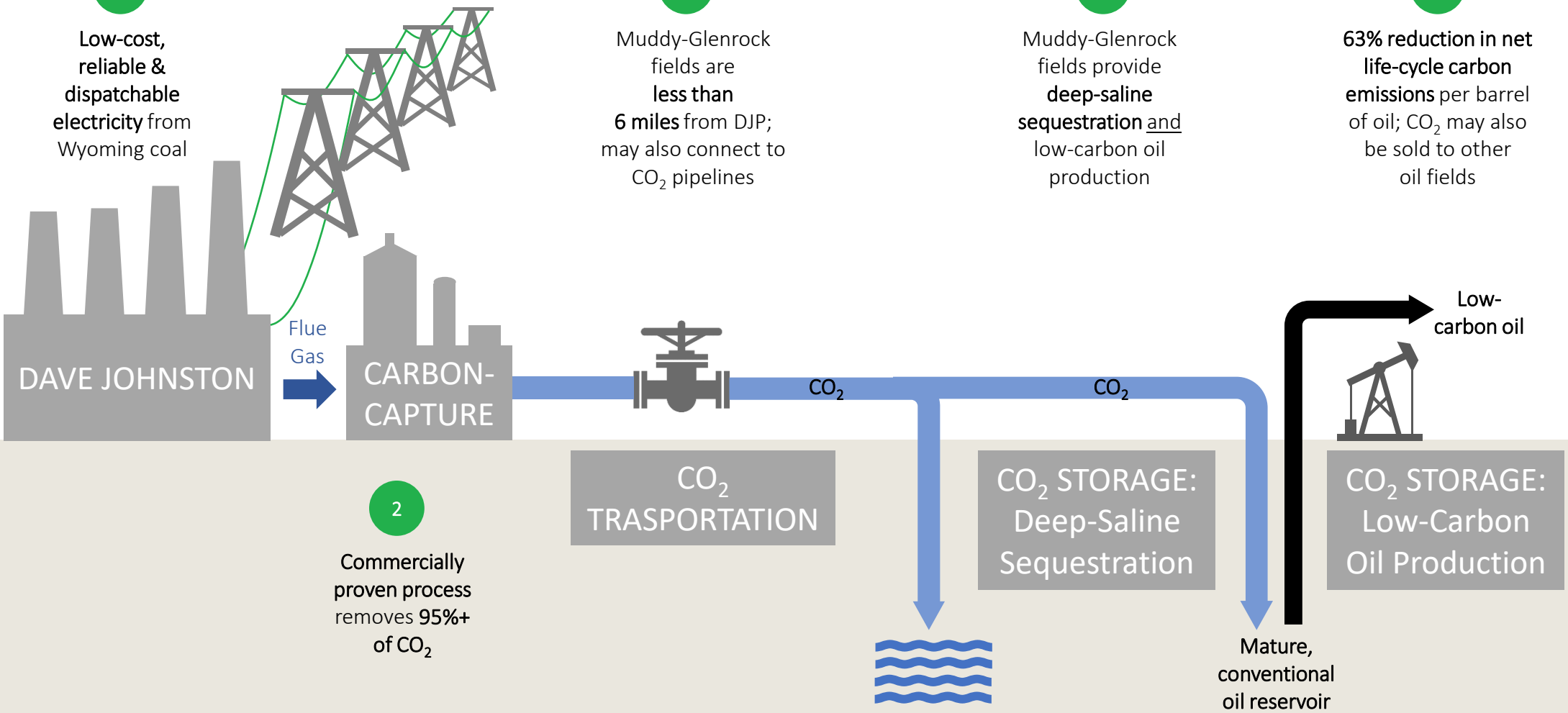
Muddy-Glenrock fields are **less than 6 miles** from DJP; may also connect to CO_2 pipelines

4

Muddy-Glenrock fields provide **deep-saline sequestration** and low-carbon oil production

5

63% reduction in net life-cycle carbon emissions per barrel of oil; CO_2 may also be sold to other oil fields



2

Commercially proven process removes **95%+** of CO_2

Glenrock Project: Schematic – "New Naughton"

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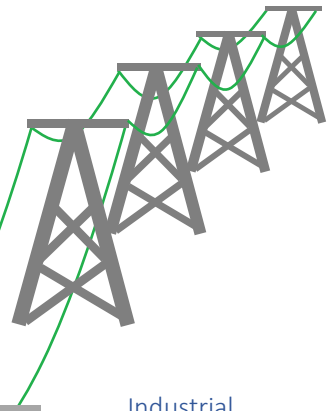
Zero-emission coal gasification & generating unit, using existing Naughton feedstock & other infrastructure

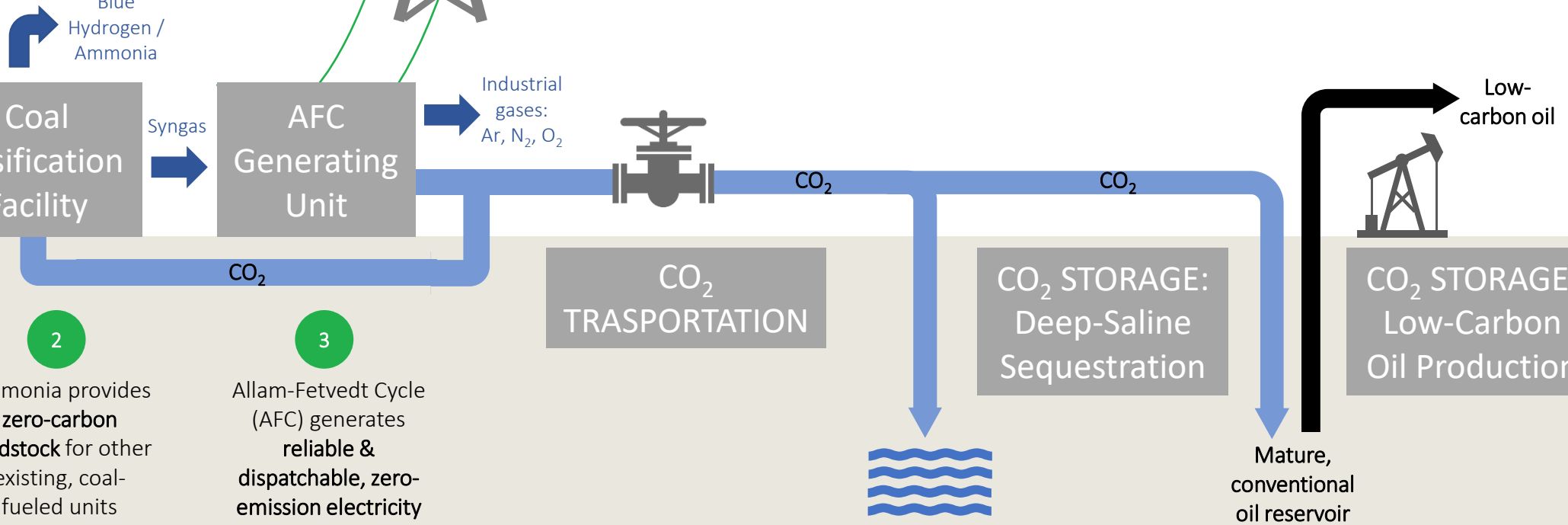
1 Convert Kemmerer Mine coal into **syngas**, **blue hydrogen**, and/or **ammonia**

4 Connect to **CO_2 Hub**; Greater Green River Basin represents 44% of Wyoming CO_2 storage capacity

5 Wyoming fields provide **deep-saline sequestration** and low-carbon oil production

6 **63% reduction in net life-cycle carbon emissions** per barrel of oil





2 Ammonia provides **zero-carbon feedstock** for other existing, coal-fueled units

3 Allam-Fetvedt Cycle (AFC) generates **reliable & dispatchable, zero-emission electricity**

Conclusion

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Carbon-Capture Will Afford Numerous Benefits for Wyoming

- ✓ Reduced greenhouse gas emissions
- ✓ Reliable & dispatchable, low-cost electricity
- ✓ Existing infrastructure & resources
- ✓ Employment
- ✓ State & local revenue
- ✓ Energy security

Dave Johnston & New Naughton: STRONG Project Development Candidates

A natural next step:

- The ITC is for demonstration;
- The SMNR at Kemmerer is for demonstration, and
- A carbon-capture project at Dave Johnston that is a commercial demonstration

Programs are important first steps of statewide initiative

- Multiple CO_2 sources, pipeline network & storage sites
- Non-replicable economies of scale
  - 3.5 GW of generating capacity (1)
  - 90 billion tons of CO_2 storage capacity (2)
  - 1.6 billion barrels of low-carbon oil reserves (3)

Stakeholders are committed to carbon-capture in Wyoming

- Avoid devastating economic & societal consequences of generating station retirements
- Continue Wyoming's long history of energy innovation

(1) Based on nine generating units incorporated in the August 2020 DOE study
(2) Source: U.S. Geological Survey, 2013
(3) Source: Advanced Resources International, Inc., 2018